

REMARKS

1. Status of the Claims

Claims 5–20 were pending in the application. Claims 5 and 15–20 have been cancelled without prejudice. Claims 6–14 have been amended to clarify the invention, and claims 21–27 have been added. Support for the claim amendments and new claims is found in the originally filed specification, including the originally filed claims. No new matter has been added. Upon entry of the present amendment, claims 6–14 and 21–27 will be pending.

2. The Double Patenting Rejection Should Be Withdrawn

Claims 5-20 are rejected under the judicially created doctrine of obviousness-type double patenting as allegedly being unpatentable over claims 1-4 of pending Application No. 10/542,168 to Kim *et al.*

Applicants respectfully traverse the rejection. But, solely to promote the allowance of the case and without acquiescing to the Examiner's rejection, a terminal disclaimer over Application No. 10/542,168 is submitted herewith. Thus, Applicants respectfully request that the nonstatutory obviousness-type patenting rejection be withdrawn.

3. Art Rejections

The Office Action rejected claims 5–20 under 35 U.S.C. § 103(a) as allegedly being obvious over United States Patent No. 3,531,265 to Dille *et al.* (“Dille”) in view of KR 1999-0080808 to Hong *et al.* (“Hong ’808”). The Office Action has rejected claims 5–20 under 35 U.S.C. § 103(a) as allegedly being obvious over United States Patent No. 4,439,349 to Everett *et al.* (“Everett”) in view of Hong ’808. Applicants respectfully traverse.

The Claims Are Not Obvious Over Everett In View Of Hong ’808

New independent claim 21 is directed to a method for deodorization using one or more of nano carbon balls, comprising contacting one or more of the nano carbon balls with a malodorous substance, wherein the malodorous substance is absorbed in the mesoporous shell or the hollow core of one or more of the nano carbon balls, and wherein the step of contacting deodorizes the malodorous substance. Support for new claims 21-27 is found in the originally filed specification, for example, at p. 1, ll. 10–17; p. 2, ll. 5–8; p. 3, ll. 12–25; p. 7, ll. 17 – p. 8, ll. 2; and p. 12, ll. 12–14. Independent claim 21 recites the limitations of cancelled claims 15 and 16, *i.e.*, that the nano carbon ball for deodorization comprises a mesoporous shell having a thickness of 50 nm to 500 nm and a hollow core having a diameter

of 10 nm to 1,000 nm. Therefore, no new matter has been added. Claims 6–14 have been amended to be dependent from new claim 21.

Neither Everett nor Hong '808, taken singly or in combination, teaches or suggests Applicants' metal-impregnated nano carbon balls or Applicants' claimed method of using the nano carbon balls for deodorization. Applicants respectfully point out that Everett does not teach or suggest Applicants' nano carbon balls, said carbon nano ball comprising a mesoporous shell with a thickness of 50 nm to 500 nm and having a hollow core with a diameter of 10 nm to 1,000 nm. Everett's mesoporous carbon is an entirely different structure. Everett seeks to provide a structure have mesoscale size pores by stacking solid spherical carbon particles in an ordered arrangement such that the spaces between the solid particles, referred to as interstitial pores, have the desired dimensions. Specifically, Everett discloses "an adsorbant wide pore carbon comprising a form-stable assembly of a family of contiguous spheroidal (preferably spherical or oblate spherical) carbon particles wherein *the surfaces of adjacent contiguous particles define interstitial pores*" (see Everett at col. 1, ll. 61-66, emphasis added). In particular, Everett seeks to overcome the drawbacks of the prior art that did not provide means for packing carbon particles in a regular assembly (*Id.* at col. 1, ll. 34-40). Everett's form-stable assembly is formed by depositing carbonisable solid polymer particles in the desired arrangement, heating the assembly to cause partial degradation of the polymer to create the contiguous form-stable assembly (*i.e.*, to get the carbon particles to link at a point), and then heating the form-stable assembly to carbonize the polymer (*Id.* at col. 3, ll. 32-51; *see also* the Example at col. 5, ll. 27-68). According to Everett, the size of such interstitial pores "can be changed in a pre-determinable way by selective variation of the size of the particles" (*Id.* at col. 2, ll. 14-16). Specifically, "[t]he useful size of a foramen¹ is a dimension of major importance in that it has a major affect on the ability of material to diffuse into and out from the interstitial pores" (*Id.* at col. 2, ll. 37-40). In sum, Everett has provided an assembly of contiguous solid carbon particles, *i.e.*, particles that touch or contact at a point, such that the space between the particles has a mesoporous pore size, and such that the assembly does not come apart (*i.e.*, the assembly is form-stable).

The Examiner asserts that "[s]ince the carbon spheres are made by making a spherical

¹ Webster's Seventh New Collegiate Dictionary (1970) defines a foramen as: "a small opening, perforation, or orifice" (*see* page 326).

template, polymerizing a carbonizable polymer over the template, and then carbonizing the carbonizable polymer and degrading the template (example), which is the same as the method of instant specification, the carbon spheres of the art are understood to be hollow, and to have a shell size commensurate with that of instantly claimed carbon spheres.” Applicants respectfully disagree with the Examiner’s assertion that Everett teaches degrading a template to produce hollow carbon spheres. As pointed out above, Everett teaches heating the assembly of deposited polymer particles to cause *partial* degradation of the polymer in order to create the contiguous form-stable assembly, *i.e.*, to create an assembly where the spheres does not separate (*see, e.g., Id.* at col. 3, ll. 32-51; *see also* the Example at col. 5, ll. 27-68). Furthermore, Everett’s carbon particles are not hollow. Everett provides an assembly having interstitial pores between solid carbon particles by stacking an arrangement of polymer particles and producing a non-separable contact between the solid particles. Therefore, one of ordinary skill in the art would not be motivated to derive Applicants’ nano carbon balls based on the disclosure of Everett’s form-stable assembly of solid carbon particles. Thus, Everett does not teach or suggest Applicant’s claimed nano carbon balls. Furthermore, the disclosure in Hong ’808 of impregnating microporous activated carbon systems does not cure the deficiencies of Everett. Therefore, Applicants submit that the combined teachings of Everett and Hong ’808 do not render obvious Applicants’ claimed method of using metal-impregnated nano carbon balls for deodorization.

Accordingly, for at least these reasons, claims 5-20 and new claims 21-27 are not rendered obvious under 35 U.S.C. § 103(a) over the combination of Everett and Hong ’808. Applicants respectfully request withdrawal of the rejection.

The Claims Are Not Obvious Over Dille In View Of Hong ’808

Neither Dille nor Hong ’808, taken singly or in combination, teaches or suggests Applicants’ claimed metal-impregnated nano carbon balls or Applicants’ claimed method of using the nano carbon balls for deodorization. Applicants respectfully point out that Dille does not teach or suggest Applicants’ nano carbon balls, each carbon nano ball having a mesoporous shell having a thickness of 50 nm to 500 nm and a hollow core having a diameter of 10 nm to 1,000 nm. Dille teaches a method of removing entrained particulate carbon from the gas stream of raw synthesis gas for re-use as feedstock to produce more synthesis gas (*see* Dille at col. 2, ll. 40–46). The particulate carbon is a by-product from the production of the synthesis gas (*Id.* at col. 1, ll. 57–67). Dille’s synthesis gas is produced by partial oxidation of a feedstock comprising a mixture of hydrocarbon oil and a concentrated iron hydroxide

flocced carbon-water slurry at a temperature of 1800-3000°F (*Id.* at col. 1, ll. 11-27 and col. 3, ll. 40 – col. 4, ll. 9). That is, Dille's synthesis gas is formed from the combustion of a hydrocarbon. Dille's particulate carbon is one of the by-products of the combustion process, *i.e.*, a result of the incomplete combustion of the hydrocarbon (col. 4, ll. 10-16). As disclosed in Hong '808, a simple activated carbon is a solid substance obtained by incomplete combustion of hydrocarbons (*see* Hong '808 at page 4, ll. 23 – page 5, line 7). Therefore, according to the disclosure in Hong '808, the by-product particulate carbon disclosed in Dille is an activated carbon. As a result, Applicants' nano carbon balls would not be rendered obvious based on the disclosure of Dille's activated particulate carbon. The Examiner asserts that Dille's particulate carbon is understood to be a mesoporous carbon based on its particle size and its high surface area. But as disclosed on page 5, ll. 1-5 of Hong '808, an activated carbon has a tremendously large surface area, even though it does not have a mesoporous structure. Furthermore, Applicants' nano carbon balls is at least about 110 nm in diameter (*i.e.*, a mesoporous shell about 50 nm thick surrounding a hollow core about 10 nm in diameter), which is much larger than Dille's 70 nm particulate carbon. As disclosed on page 3, ll. 17-19 of the application, Applicants developed the method of deodorization using the metal-impregnated nano carbon balls to overcome the limitations of impregnated activated carbon, where the deodorizing ability tends to deteriorate due to clogging of the pores. Therefore, the disclosure in Hong '808 of impregnating microporous activated carbon systems does not cure the deficiencies of Dille. Applicants submit that the combined teachings of Dille and Hong '808 do not render obvious Applicants' claimed method of deodorization using metal-impregnated nano carbon balls.

Accordingly, for at least these reasons, claims 5-20 and new claims 21-27 are not rendered obvious under 35 U.S.C. § 103(a) over the combination of Everett and Hong '808. Applicants respectfully request withdrawal of the rejection.

CONCLUSION

Applicants respectfully request that the foregoing amendments and remarks be made of record in the file of the above-identified application. Applicants believe that each ground for rejection has been successfully overcome or obviated, and that all pending claims are in condition for allowance. Withdrawal of the rejections, and allowance of the application, are respectfully requested. If any issues remain in connection herewith, the Examiner is respectfully invited to telephone the undersigned to discuss the same.

No fee is believed due in connection with this response. In the event that a fee is required, please charge any such fees to Jones Day Deposit Account No. 50-3013.

Respectfully submitted,

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